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High-grade ALFALFA HAY

Methods of producing, baling, and loading for market

rev. June 1943

U. S. Department of Agriculture, Farmers' Bulletin No. 1539

ALFAFALFA is the principal legume used for hay in the United States. During the last 20 years there has been an increase of about 5½ million acres in this crop. Most of this increase has taken place east of the Great Plains in those areas where dairying is an important farm enterprise.

The production of high-grade alfalfa hay is profitable in all major alfalfa-producing areas where freight or trucking rates to consuming districts are not prohibitive. It is also profitable in those areas where the alfalfa is to be used as feed for various types of livestock, especially dairy cattle, and it is essential in the achievement of the war-production goals for meat, dairy products, and wool.

Soundness, purity, a high percentage of leaves, clinging foliage, green color, and pliable stems are the essential characteristics of high-quality hay.

If high-quality hay is to be produced, alfalfa should be cut at the one-tenth to one-fourth bloom stage or when the foliage is beginning to turn yellow, indicating a slowing up or stopping of growth. The fancy grades, such as U. S. No. 1 Extra Leafy Alfalfa, can be produced if the alfalfa is cut in the prebud or bud stage of growth.

Alfalfa hay should be cured as quickly as possible by the method that will save the leaves and color of the hay. The method of curing will vary in different parts of the country, depending on climatic conditions. This bulletin contains suggestions that may be helpful in determining the best way to cure and store alfalfa to produce hay of high quality.

The most important item in loading practice is to load cars or motortrucks with hay of uniform class and grade. Hay transported by truck during rainy weather should always be protected from rain.

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HIGH-GRADE ALFALFA HAY: Methods of Producing, Baling, and Loading for Market

By W. H. HOSTERMAN, *marketing specialist, Food Distribution Administration*¹

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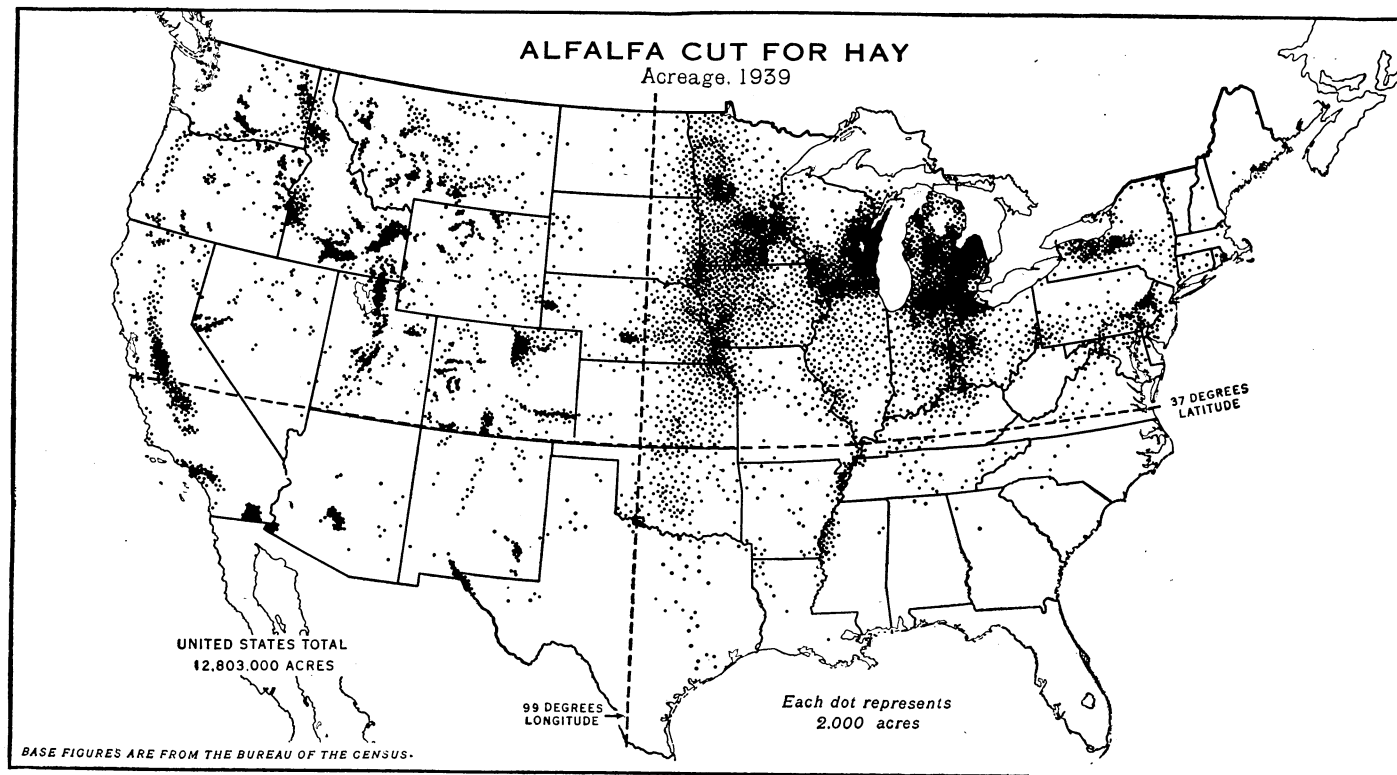
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NATIONAL IMPORTANCE OF ALFALFA CROP

ALFALFA is the principal legume used for hay in the United States. The acreage is greater than that of any other single kind of hay (fig. 1). In 1919 alfalfa occupied about 12 percent of the total hay acreage but by 1941 it had increased to about 21 percent of the total. The acreage of alfalfa is continuing to increase throughout the country because farmers and stock feeders are finding alfalfa hay "the best fodder," which is the meaning of the old Arabian word from which the Spanish name alfalfa is derived.

Most of the forage plants that are important in our agriculture were introduced on the eastern seaboard and spread westward as the settlers moved westward. Alfalfa, however, was introduced in California about 1850. It became an important forage crop in the irrigated valleys of the Western States, and its culture gradually spread eastward to the more humid areas of the Central and Atlantic States as farmers learned how to establish and maintain stands on soils which in general are not naturally adapted to the growing of alfalfa. During the last 20 years the acreage of alfalfa in the United States increased approximately 5½ million acres. There has been an increase (fig. 2A) of approximately 6 million acres in the Mississippi and Ohio Valley States of Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, and Missouri and a 600,000-acre increase in the North Atlantic States. Alfalfa acreage has been reduced in the Western and the Great Plains States. This reduction has taken place mainly in the Great Plains States (fig. 2B). The value of legume hay of high grade in the dairy ration is an important reason for this increase of alfalfa acreage east of the Great Plains in those areas where dairying has become an important farm enterprise.

¹The late Edward C. Parker was author of the original edition of this bulletin which was issued in 1929 when the work was a part of the Bureau of Agricultural Economics. He was senior author of the revision issued in 1936.



BAE 39943

FIGURE 1.—The alfalfa acreage of the United States is concentrated in those areas in which soil, climatic, and production conditions are most favorable for its growth.

INSUFFICIENT SUPPLIES OF HIGH-GRADE ALFALFA HAY FOR DAIRY USE

Today the chief demand for baled alfalfa hay is from the dairy cattle feeders. Alfalfa hay, whether grown for home use or for market, must ordinarily meet the quality demands of the dairymen if the most profitable returns are to be obtained from the crop.

Dealers in alfalfa hay receive many orders from dairymen for high-grade alfalfa hay which they cannot fill because an insufficient quantity of such hay is produced. Therefore, a much greater quantity of high-grade alfalfa could be profitably produced for home and market use.

Dairymen who do not grow alfalfa and who do not now utilize much alfalfa hay, but who depend largely on mill feeds for protein, could profitably become buyers of alfalfa hay if supplies of high-grade alfalfa hay were available at all times. Farmers who grow alfalfa for a cash crop should study market demands and then make their production and loading practices conform to the market requirements. Many farmers are intermittent sellers of low-grade surplus hay, but comparatively few specialize in the production of high-grade market alfalfa hay. Those who make a business of producing alfalfa hay for market should place more emphasis upon supplying high-grade alfalfa hay for the dairy trade.

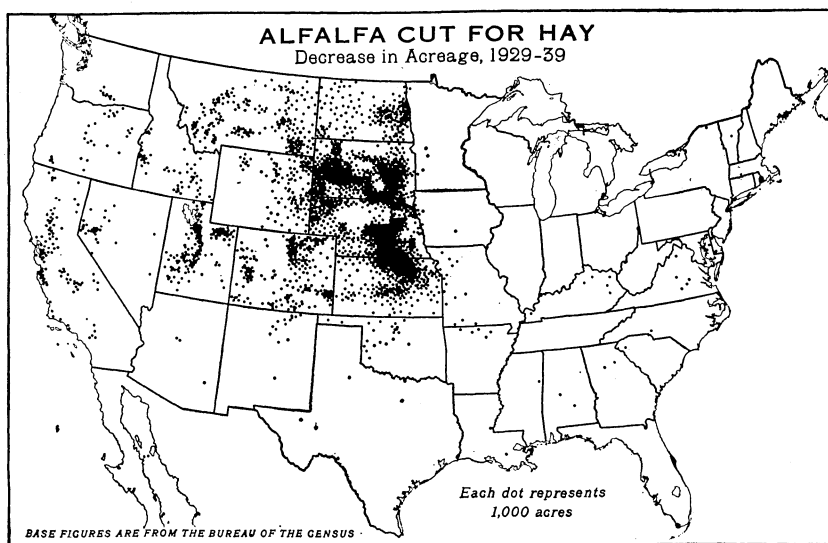
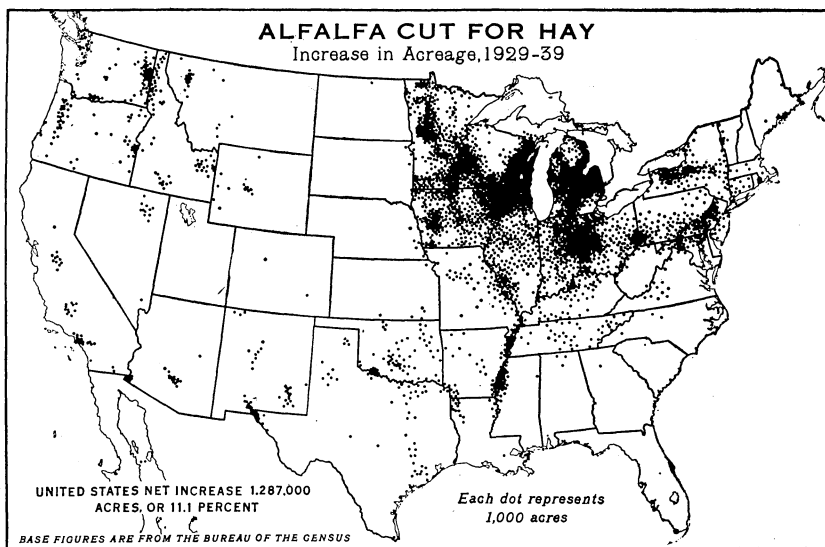
HIGH-GRADE ALFALFA HAY IS A PROFITABLE CASH CROP

High-grade alfalfa hay marketed in a businesslike manner is normally a profitable cash crop in all major alfalfa-producing areas where freight or trucking rates to the consuming districts are not prohibitive. On the other hand, there is little or no profit to the producer in marketing low-grade alfalfa hay. In some instances the price received for the low-grade alfalfa will pay for the baling and marketing expenses but in many instances it will not cover production costs and marketing expenses. Except in years of hay shortage and abnormally high prices low-grade alfalfa hay should be fed locally to stock cattle, horses, or mules, and should not be offered as commercial hay.

MARKET AND FEEDING VALUE OF HIGH-GRADE AND LOW-GRADE ALFALFA HAY

The top grades of alfalfa hay always have commanded premium prices. They will continue to do so because feeders are now generally recognizing the importance of green color, vitamins, and leafiness which are associated with high-grade hay. High-grade alfalfa hay competes with mill-feed concentrates to a considerable extent in the dairy trade but there is little or no competition between high-grade alfalfa hay and low-grade hays of any kind. The dairy cattle feeder cannot make as good use of low-grade alfalfa hay as can the feeders of other livestock. The producer of high-grade alfalfa, hay, therefore, has a specialized consumers' market in which to sell his commodity to advantage.

Data on hay prices showing the favorable market price position of the top grades of alfalfa are not available because hay is not now



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FIGURE 2.—Between 1929 and 1939 most of the increase in alfalfa acreage occurred in the States bordering on the Great Lakes while the decrease occurred in the Great Plains States of South Dakota, Nebraska, and Kansas.

being marketed through central markets to the same extent that it was 10 or 15 years ago. Moreover prices for hay probably to a greater extent than those for any other farm crop are affected by local conditions, such as size and quality of crop in a given locality.

The value of high-grade alfalfa hay as a feed on the farms where it is produced cannot always be measured in terms of market prices.

The liberal feeding of the hay to dairy cattle results in material savings in the cost of grain feeds and concentrates without material loss in milk production.

This fact is illustrated by feeding experiments with dairy cattle conducted by the Bureau of Dairy Industry, United States Department of Agriculture, in which cows were fed all the high-grade alfalfa hay they would eat together with a full-grain ration, all the alfalfa hay they would eat together with half of a full-grain ration, and all the alfalfa they would eat without any grain ration. The milk production obtained from the feeding of hay only was about 70 percent of the production obtained from the feeding of hay and the full-grain ration, and the milk production obtained from the feeding of hay and one-half of the full-grain ration was approximately 90 percent of that obtained from feeding the hay plus the full-grain ration.

These experiments indicate that those dairymen who have home-grown, high-grade alfalfa hay available for feeding purposes can reduce materially the quantity of grain concentrates necessary to maintain good milk production, thus effecting savings in the total feed cost, although the milk production may not be as high as when a full grain ration is fed.

CHARACTERISTICS OF HIGH-GRADE ALFALFA HAY

Soundness, purity, a high percentage of leaves, clinging foliage, green color, and pliable stems are the essential characteristics of high-grade alfalfa hay. Alfalfa hay having these desirable qualities is the type of legume forage that is always in demand with the dairy cattle feeders because of its well-recognized beneficial effect on milk flow.

In the official United States hay standards,² alfalfa hay is classified according to its purity. The class name "Alfalfa" may not contain over 5 percent of grasses nor over 10 percent of other legumes. If the grass content is over 5 percent but not over 20 percent the class is designated as "Alfalfa Light Grass Mixed." The grading factors in the United States standards are leafiness, color, and foreign material, any one of which may cause the grade of a lot of hay to be lowered. Leafiness is considered the most important grading factor because two-thirds or more of the protein of the alfalfa plant is carried in the leaves. Thus a leafy type of alfalfa hay is relatively high in protein, and a stemmy type is relatively low. Leafy types of alfalfa hay, also, commonly have relatively pliable stems.

Green color is also an important measure of quality because there is a correlation between the quantity of green color and the quantity of carotene, or provitamin A, in alfalfa hay. A high percentage of green color indicates a relatively high carotene content. Palatability, other feed nutrients, and laxative properties are also commonly associated with bright-green color. For these reasons the importance of green color is emphasized especially in the grades of alfalfa hay that are used in dairy and poultry feeding. Weeds, stubble, rakings from previous cuttings, and other foreign material are waste in alfalfa hay. The United States standards do not permit over 5 percent of foreign material in the grade of No. 1 Alfalfa.

² United States Department of Agriculture Handbook of Official Hay Standards, Revised. Effective July 1, 1940.

CAUSES OF LOW-GRADE ALFALFA HAY

Federal hay inspections at shipping and receiving points, as well as observations made by representatives of the United States Department of Agriculture in numerous alfalfa areas, show that the most common causes of low-grade in alfalfa hay are the following:

Thin stands of alfalfa on meadows in which weeds and grasses have taken the place of alfalfa. Thin stands also cause relatively coarse, hard stems, and a lower percentage of leaves is borne on coarse stems than on fine stems.

Weather damage, which causes loss of green color, leaf shattering from extra handling, stack spots in poorly built stacks, and mustiness or moldiness if stacked, baled, or loaded while wet.

Overripeness at time of cutting, which causes a relatively low degree of leafiness, hard and fibrous stems, and a weak and faded color.

Overdrying, in the swath, windrow, cock, or small stack, which causes a severe shattering of the leaves, brittle stems, and a loss of green color from sun bleaching.

Baling undercured hay from windrows or cocks followed by immediate storage or loading into cars, which causes heating, mustiness, and moldiness.

Stacking distinctly undercured hay, which causes severe fermentation often resulting in extensive mustiness and moldiness.

Baling dry hay during very hot, dry, or windy weather, which shatters the leaves and causes stemmy appearing bales or bales with a low percentage of leaves. Bales with a high percentage of shattered leaves are not wanted by dairymen because of the leaf losses incurred in handling the hay in dairy barns.

GOOD STAND NECESSARY TO PRODUCE HIGH-GRADE ALFALFA HAY

A good crop of high-quality alfalfa hay can be produced only from a pure, dense stand. Such a stand can be secured only by sowing on a properly prepared seedbed a sufficient quantity of seed that is adapted to a given locality and that is free from weed seeds.

Good crops of high-grade alfalfa hay cannot be produced on meadows with thin stands nor on very old meadows where a part of the stand has died out. Invariably such meadows are weedy and grassy, the stems of the alfalfa are relatively coarse and the percentage of leaves is relatively low. Under these conditions it is impossible to produce pure, leafy alfalfa hay that will have a high feed value or that will have an attractive appearance in the bale. Good policy in the production of high-grade alfalfa hay, as well as good crop-rotation practice, requires that old meadows with thin stands be broken up and reseeded. The yield per acre is low on old meadows, and the percentage of weeds and grasses is usually high. Weeds may lower the grade of alfalfa hay. Grass-mixed alfalfa hay, even though it be of high grade, does not sell on a parity with pure alfalfa hay of equal grade nor does it have equal feed value.

Alfalfa from pure, thick stands has the fine stems and high degree of leafiness essential to the making of the high-grade type of hay that is preferred for dairy-cattle feeding.

IMPORTANCE OF CLEAN MEADOWS

Buyers and dealers discriminate against alfalfa hay containing grain stubble, corn stubs, alfalfa roots, or rakings of the previous cutting. All these materials are defined as foreign material in the United States hay standards, and alfalfa hay is graded downward in all cases in which a lot of hay meets the leafiness and color requirements of any one of the numerical grades but the percentage of foreign material exceeds the maximum quantity allowed for that grade. The grade of U. S. No. 1 Alfalfa tolerates a maximum of 5 percent of foreign material; No. 2 grade, 10 percent; No. 3 grade, 15 percent; and if the foreign material exceeds 15 percent but does not exceed 35 percent, the hay is graded Sample grade. For this reason producers who sell baled alfalfa hay should give careful attention to keeping the meadows clean and free from trash.

Meadows should be raked in the spring of each year to remove as much as possible of the grain stubble, corn stubs, or old alfalfa roots in newly seeded fields, and to remove any spoiled hay that may have been left on the meadow from the previous year. After each cutting the meadows should be carefully raked to clean up the loose rakings before new growth begins.

WEATHER DAMAGE

The lowering of the grade of alfalfa hay because of rain damage while the hay is in the swath, windrow, or cock cannot always be prevented even by the most skillful farmers. There is no escape from the unexpected rain that falls on hay before it is stored away. But close study of Weather Bureau reports is of genuine value to hay producers when planning their hay operations and will decrease the chances for damage. Damaged hay resulting from poorly built stacks (fig. 11, B), uncovered piles of bales, hauling and loading during storms, and baling rain-damp hay can be prevented by forethought and good management. Loss of grade on account of rains, heavy dews, and fogs during the curing process is minimized when alfalfa is cut at the proper stage of maturity and thereafter handled with modern machinery and by approved methods for curing hay.

IMPORTANCE OF COLOR

For many years the impression prevailed among farmers and hay dealers that green color was not important as a feed constituent but did indicate proper curing and storage and therefore indicated soundness of the hay. For these reasons market premiums have been paid for green-colored hay. In recent years it has been found that green alfalfa hay is also a good source of carotene or provitamin A.

The Bureau of Dairy Industry has conducted feeding experiments to determine the nutritive value of the carotene content of alfalfa hay of various grades. These experiments indicate that when dairy cows are fed a liberal quantity of alfalfa hay of high grade as the only source of carotene, the cows maintain their health, milk yield, and reproductive capacity for periods ranging up to more than 7 years. Comparisons of the carotene content of U. S. No. 1 Alfalfa and U. S. No. 3 Alfalfa indicate that the former has about five times the carotene con-

tent of the latter. These experiments also indicate that the carotene or provitamin A is carried over into the milk and butter produced.

GRADE AFFECTED BY TIME OF CUTTING

TIME OF CUTTING RECOMMENDED

In most instances alfalfa should be cut at the one-tenth to one-fourth bloom stage (fig. 3). In those areas where alfalfa blooms sparingly because of seasonal moisture conditions the amount of bloom is not a dependable index of the maturity. Under these conditions the growth of the basal shoots and the general appearance of the field should serve as a guide for time of cutting. If the basal shoots have made considerable growth, or if the foliage is beginning to take on a yellow cast indicative of the slowing up or stopping of growth, the alfalfa should be harvested regardless of the percentage of bloom. Little, if any, increase of tonnage will be gained by allowing the crop to stand longer, and the yield of protein per acre will be reduced. At this stage of maturity the leaves usually constitute anywhere from 45 to 55 percent of the total weight of the plants, and the stems have not become objectionably hard and woody.

Extensive experiments in Ohio on time and number of cuttings of alfalfa have demonstrated that a system of calendar dates, carefully interpreted for seasonal weather conditions, is more satisfactory than any other system for determining when to make the various cuttings in areas where alfalfa blooms sparingly. In areas where leafhoppers are numerous the alfalfa should be cut before the leafhoppers have caused much damage, regardless of stage of maturity.

The grade of U. S. No. 1 Alfalfa can be attained in practically all alfalfa districts of the United States when crops are cut at the one-tenth to one-fourth bloom stage of maturity, providing the hay is properly cured and stored and not subjected to much damage from weather. In fact, where stands are thick and well watered, the special or fancy grades of U. S. No. 1 Extra Leafy Alfalfa or U. S. No. 1 Extra Green Alfalfa can be obtained from hay cut at this stage of maturity.

BUD-STAGE CUTTING

The highest possible quality or grade of alfalfa hay is obtained when the crop is cut in the prebud or bud stage. At this growth stage the stems are soft and pliable, the leaves constitute 55 to 65 percent of the total weight of the plants, the amount of rich, natural green color is great, and the percentage of protein is exceptionally high.

It is impracticable and unprofitable, however, to cut all the various crops in the year at the prebud or bud stage of maturity. In the first place, the yearly tonnage is usually not so great as when the cutting is done at one-tenth to one-quarter bloom. In the second place, a continuous practice of bud-stage cutting usually weakens the vitality of the crowns and roots, shortens the life of the meadow, and causes an increase of grasses and weeds in the meadow. The harmful effects of bud-stage cutting can be minimized to a certain extent by allowing the alfalfa to make enough growth in the fall so that root reserves are built up for the next season. Experimental evidence on the time of

cutting alfalfa indicates, however, that occasional bud-stage cuttings, such as one in three, or possibly one in two in very favorable alfalfa climates, may be made without seriously affecting the vitality and thickness of the stand.



FDA 12124

FIGURE 3.—Mowing alfalfa hay. To make high-grade hay the crop should be cut when one-tenth to one-quarter in bloom, or when new growth starts from the crowns. After half bloom, the stems become hard, and many leaves are shed. Leafiness is the most important factor in grading and market value.

EFFECT OF LATE CUTTING

Large quantities of alfalfa hay are produced yearly in the United States from crops cut at full-bloom or in the early pod stage of maturity, or which have been allowed to stand for a week or 10 days after growth has ceased. This type of hay is especially common in the first cutting made each season in the North Central and Mountain States. Hay is also cut at that stage in the eastern part of the United States in those areas where timothy or other similar grasses are sown with the alfalfa as an erosion-prevention measure. If the mixture is not cut until the timothy begins to bloom the alfalfa will be in the early pod stage of maturity. In the majority of cases the grade for alfalfa hay of this character is lower than No. 1 under the United States standards, irrespective of weather damage, either because of insufficient leaves or of insufficient color for the No. 1 grade, and sometimes because of both insufficient leaves and color. Under very favorable conditions of growth and curing, alfalfa cut anywhere from half-bloom to the early pod stage will retain sufficient leaves for the grade of U. S. No. 1 Alfalfa, but in many cases the plants shed so many leaves from the lower half of the stalks after half bloom that the percentage of leaves in the cured hay is below the 40-percent requirement of U. S. No. 1 Alfalfa. Alfalfa which is

allowed to stand after active growth has ceased will lose many of the lower leaves and usually will not meet the requirements for U. S. No. 1 Alfalfa.

Late-cut alfalfa usually has hard and relatively woody stems which are not very objectionable to horse, mule, and stock-cattle feeders, but which are objectionable to dairy-cattle and sheep feeders. Many producers could profitably advance the cutting stage a week or so, for the first cutting. A better grade of alfalfa hay would result, and the seasonal tonnage would be increased because of the longer growing period thus given to later cuttings.

The United States alfalfa standards contain a provision that "hay in which a majority of the alfalfa stalks bear brown and/or black seed pods shall not be graded No. 1 of any class or be assigned any special grade except Coarse." The intention of this specification is to keep all poddy and overripe hay out of the No. 1 grade because of its woody character and its low feed value as compared with earlier cut hay.

TIME OF CUTTING AND WEATHER DAMAGE

Cutting alfalfa not later than one-fourth bloom provides a safeguard of considerable value against losses in quality that may occur during the curing period from sun bleach, overdrying, and damage from rain or heavy dew. The U. S. No. 1 grade for alfalfa hay does not demand perfect color nor a perfect degree of leafiness. It tolerates a moderate degree of sun bleach, shower, or dew discoloration, and the mechanical loss of a part of the leaves from handling. Thus early cut alfalfa, if perfectly cured, has a degree of color and leafiness above the minimum requirements for the No. 1 grade and can suffer moderate damage without having its grade lowered.

When alfalfa is cut at or near the full-bloom stage, however, it has already lost some of its leaves and color and is thus at the bottom of the No. 1 grade, or possibly in the No. 2 grade, even though the curing is perfectly accomplished. Such hay loses its grade rapidly if swath bleaching, overdrying, or rain or dew damage occurs during the curing period. The earlier cut hay enters the curing period with a surplus of quality which the late cut hay lacks.

CURING METHODS TO PRESERVE LEAFINESS AND COLOR

Haymaking methods for high-grade alfalfa hay must give first consideration always to the preservation of maximum amounts of leafiness and color. These methods will vary considerably in different parts of the country depending on climatic conditions. Methods for the rapid evaporation of moisture should be used, but such methods should not sacrifice a high degree of leafiness and color in order to save time in curing.

Newly mown alfalfa has a moisture content of 70 percent or more, and thoroughly air-dried hay about 12 percent. Alfalfa hay is ordinarily dry enough to stack or mow safely when the moisture content has been reduced to 25 percent, and it should be somewhat drier (about 20 percent moisture) if it is to be baled from the windrow. It may be cocked safely when only wilted and when the moisture content is about 40 percent.

As no accurate moisture tests are possible for the haymaker, he can only follow such general tests as are based on experience and judgment. One practical method that is used by farmers for determining when alfalfa is cured is to twist a wisp of the hay in the hands. If the twisted hay is tough and there is evidence of moisture where the stems are broken the hay is considered too sappy for safe storage. If the stems are slightly brittle when broken and there is no evidence of moisture when the stems are twisted the hay can be stored without danger of spoilage. Another method is to scrape the outside of the stems with the finger or thumb nail. If the epidermis can be peeled from the stem the hay is considered undercured. If it does not peel off the hay is usually dry enough to stack or put in the mow.

PREVENTION OF OVERDRYING

Preservation of a high degree of leafiness and color demands that all handling of alfalfa be done when the hay is in a tough or at least slightly tough condition. Overdrying in the swath or windrow invariably results in a material shattering and loss of leaves during the raking, stacking, or windrow-baling processes, and the loss of much green color from sun bleaching.

It is essential for the haymaker to time the operations of cutting, raking, cocking, stacking, and baling, so that the final storage or baling work can be reached with the machinery and crew available before overdrying and shattering takes place. One of the principal causes for overdry and shattered alfalfa hay is the tendency on the part of many producers to cut more hay than can be raked and stored while in good condition for handling with the machinery and crew available.

TIME OF DAY TO BEGIN CUTTING

The best time of day to begin cutting varies according to local climatic conditions. In arid climates, where dews are uncommon and where the night temperatures are relatively high, many skilled alfalfa-hay producers begin cutting in the late afternoon and then begin raking and windrowing at sunrise when the hay is wilted. In areas of dews and cool nights the best time to begin cutting is usually considered to be in the early morning. External moisture like dew is not much of a factor in determining the best time of the day at which cutting should be done. The additional percentage of moisture from sources of this kind will not affect materially the length of time required to cure the hay.

Essential points to consider are (1) facilitating rapid evaporation of a large part of the moisture in the newly mown hay by exposing it to sun and wind in the swath, where the rate of evaporation is faster than in the windrow, bunch, or cock, and (2) performing the operations of raking and windrowing while the hay is tough (fig 4) and the leaves are not easily shattered.

SWATH CURING

The rapid evaporation of moisture and the preservation of leafiness and color are jointly accomplished in the most practical way when the hay is well wilted in the swath and then either windrowed with

the side-delivery rake or cocked to complete the evaporation of moisture to the degree at which the hay may be stored or baled. No definite period of time for swath curing should be assigned, as it will vary greatly according to tonnage of hay per acre, temperature, sunshine, wind, and atmospheric humidity. The rule should be rather in terms of the condition of the hay in the swath; that is, the hay should not be raked until just before the leaves are dry enough to shatter. Hay should not be left in the swath overnight in a humid climate because partly cured hay which has become wet from dews will suffer a material loss of green color while it is again drying out.

USE OF TEDDERS AND DUMP RAKES

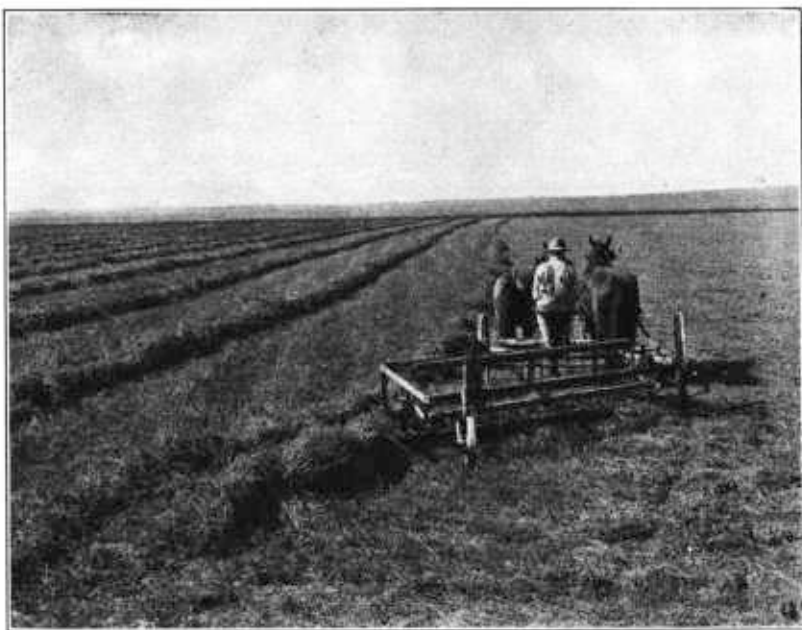
The choice and the proper use of machinery for handling alfalfa from the swath to the windrow or cock are subjects worthy of careful consideration in the production of high-grade hay. Some years ago the tedder or "kicker" was rather widely used to loosen heavy cuttings of alfalfa and clover in the swath, and thus facilitate the evaporation of moisture. The tedder has been largely abandoned in recent years because it tends to shatter the leaves of legume hays. The dump rake, also commonly employed for windrowing and bunching alfalfa, is fast being supplanted by the side-delivery rake. Alfalfa hay which is gathered from the swath into windrows with a dump rake will often be lowered in grade because of this method of raking. When the dump rake is used to rake wilted hay there is a tendency to rake the hay into large, wide, and ragged windrows, in which the hay bleaches and overdries on the top, but remains undercured and damp underneath. Unless such windrows receive extra handling to cure the under side of the windrow, damp slugs of undercured hay will get into the stack, mows, or bales, and cause fermentation and moldiness. When the hay is left in the swath until all of it is completely cured and then raked into windrows with the dump rake, the leaves are usually badly shattered unless the raking is done in the morning when the hay is tough from dew.

Hay will cure as rapidly in the dump-rake windrow as in the side-delivery-rake windrow if the windrows are of the same size. When windrows are made with the dump rake, however, a considerable quantity of hay is not gathered into the windrows because the rake does not gather any hay for a distance of 3 or 4 feet beyond the dump when the teeth are raised to dump the hay. Such unraked hay is thus left in the swath to bleach and overdry. Under ordinary raking conditions it is not possible to make small, neat windrows with the dump rake. If it is planned to cure alfalfa mostly in the cock, the dump rake is an efficient machine to use in bunching the windrows before cocking.

USE OF SIDE-DELIVERY RAKE

The side-delivery rake is specially adapted to making windrows of wilted and tough alfalfa that will aerate and cure uniformly with the minimum loss of leaves and color (fig. 4). It rolls the hay into loose, cylindrical windrows, through which there is a better circulation of air than in the flat windrows made with the dump

rake. This facilitates evaporation. Many of the stalk butts are exposed to sun and wind, while most of the leaves are protected from overdrying within the roll, and will thus cling to the stalks. Furthermore, a large proportion of the leaves and stems will cure in such windrows without the bleaching that comes from direct exposure to sunlight in the swath or in the wide, flat windrows made with the dump rake. The size of the windrow can also be better controlled with the side-delivery rake. Hay will cure more rapidly in a small to medium windrow than in a large windrow. With light crops, double windrows are usually made, as back furrows are made in plowing, to facilitate gathering the hay with the loader, sweep rake, or



FDA 12118

FIGURE 4.—Windrowing alfalfa hay with the side-delivery rake. Tough hay so raked aerates and cures uniformly with minimum loss of leaves and color. Rain damage is minimized. Uneven curing, bleaching, and leaf shattering often occur in windrows made with the dump rake.

pick-up baler; but with heavy crops it is best to make single windrows, which can be turned over with the rake when hay needs further drying, and especially when it needs further drying after rains.

Average crops of alfalfa hay wilted in the swath will cure almost as quickly in side-delivery-rake windrows as though fully cured in the swath, and the grade of the hay will be much superior. With very heavy cuttings, wilting in the swath, windrowing with the side-delivery rake, and finally turning the windrow with this rake, will allow the hay to cure more uniformly and rapidly than complete swath curing, and the hay will be of superior quality. The side-delivery rake is essential in the production of high-grade alfalfa hay.

METHODS OF HANDLING ALFALFA HAY FROM WINDROW

Various methods are in use in the important alfalfa areas for the handling of windrowed hay, such as (1) stacking from the original windrows or bunched windrows with sweep rakes or hay sleds; (2) bunching and cocking, followed by stacking, with the cocks carried to the stacks by sweep rakes; (3) loading wagons from the windrows with the hay loader (fig. 5) and hauling to barns or stacks, where unloading is done with slings or forks; (4) baling direct from windrows, using hay loaders and wagons or sweep rakes to move the hay from the windrows to the press; (5) bunching and cocking, followed



FDA 12104

FIGURE 5.—Gathering hay with the hay loader. The loss of leaves in gathering by this method is usually less than when the hay is handled with sweep rakes.

by baling from the cocks with a portable baler; and (6) baling directly from the side-delivery-rake windrow with pick-up windrow baler.

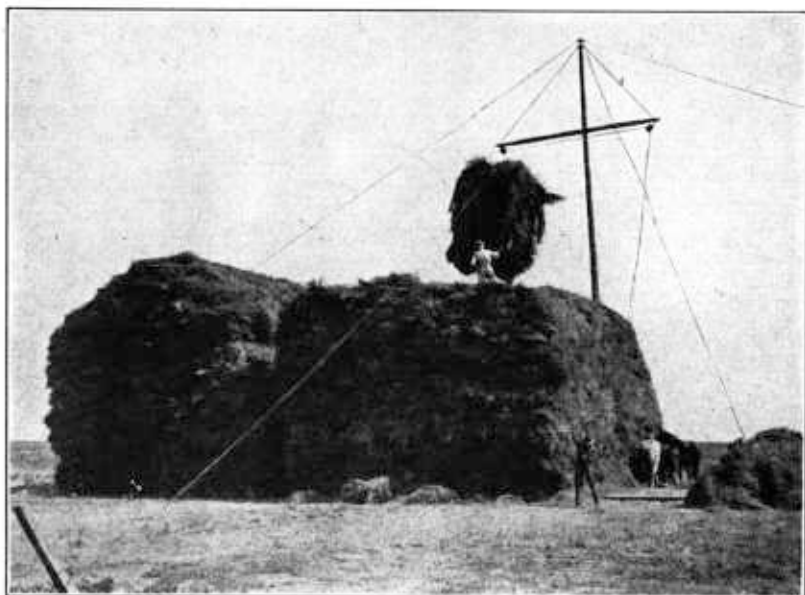
DIRECT STACKING OR DIRECT BALING

Direct stacking and direct baling are the methods most commonly used in handling hay from the windrow. In times of relatively high wages and scarcity of farm labor the practice of cocking hay to cure it in the field, or to insure it against rain damage, is not common. If large fields of hay are to be harvested, time and cost usually make it necessary for the farmer to place greater reliance upon the side-delivery rake, the hay loader, the sweep rake and stacker, and upon

the organization of his crew to provide rapid haulage and storage or baling, than upon the more expensive and tedious practice of cocking. But the practice of cocking alfalfa hay persists and is often necessary in sections that have much rainfall, heavy fogs or dews, or continuous high temperatures and dry atmospheric conditions which cause hay to overdry and bleach quickly in the swath or windrow.

SWEATING HAY BEFORE BALING

In the production of high-grade alfalfa hay for market, sweating the hay in cocks or stacks prior to baling is most desirable (fig. 6). If the hay is cocked while tough, or stacked while slightly tough and then goes through a light to moderate sweat, it develops attractive



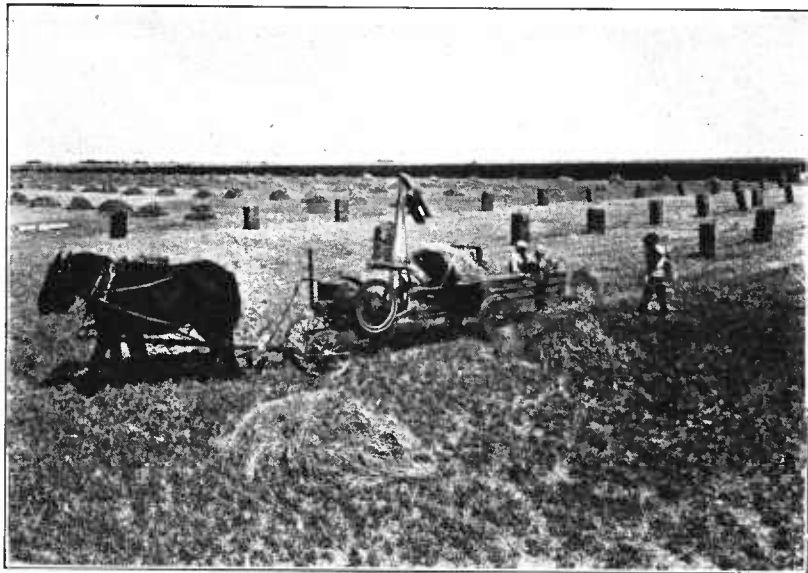
FDA 12035

FIGURE 6.—Hauling alfalfa hay from the field on sleds and lifting it on the stack with slings keeps the hay free from dust and preserves its leafiness to a greater extent than when it is pushed to the stacks with sweep rakes. A high grade of alfalfa hay usually results when slightly tough hay is well stacked by these methods and then allowed to sweat before it is baled.

aroma, the leaves are preserved in a clinging condition, and the hay when baled can be shipped long distances with practically no risk from heating. Either of these methods, moreover, allows considerable latitude in the condition of the hay at time of cocking or stacking, whereas in baling direct from the windrow, the grade of the hay may be injured either from overdrying, which causes shattering and loss of leaves during the baling process, or from undercuring, which results in bale sweating, heating, and molding, especially if the bales are pressed under heavy tension or packed tightly in piles or cars.

COCKING AND BALING WITH PORTABLE BALER

In the arid regions where high temperatures usually prevail during the haying season, the practice of cocking tough alfalfa hay in large cocks, curing and partial sweating in the cocks for several days, and then baling from the cocks with a portable press (fig. 7) is to be highly recommended to producers who plan to sell high-grade hay to the dairy trade. The method is ideal for the production of a clinging-leaf type of hay which also has fancy color except for the small quantity of hay that bleaches on the outside of the cocks. This method is not well adapted to extensive farming because of the hand



FDA 12308

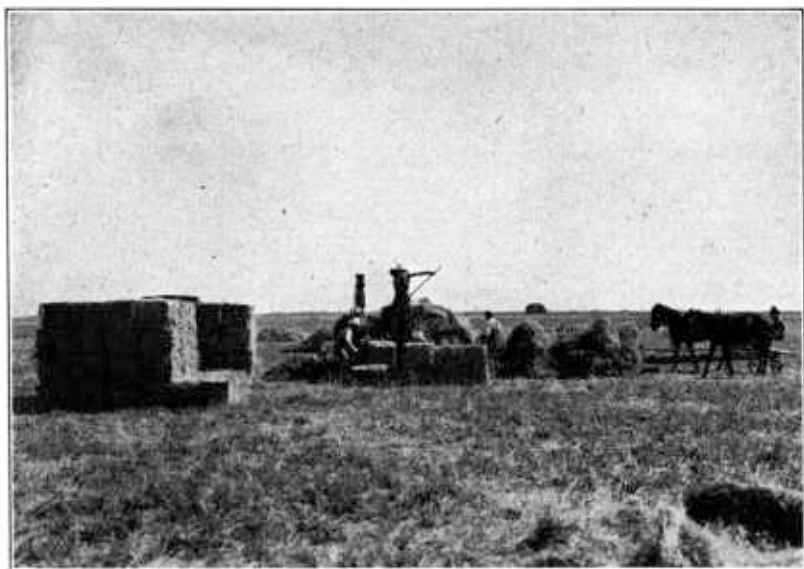
FIGURE 7.—Baling cocked alfalfa hay with a portable press in an arid region. If the hay is cocked while tough and cured a few days before baling a high-grade hay with distinctly clinging foliage usually results. Its value usually offsets the additional labor costs.

labor involved and the difficulty of baling and storing a large quantity of hay in a short period of time, but on relatively small alfalfa farms it is a most profitable method if the grade and sale value of the hay are taken into consideration.

STACKING AND BALING FROM STACKS

In the West North Central and Mountain States the practice of stacking alfalfa directly from the windrow while the hay is in a slightly tough condition is usually the most satisfactory method to follow year after year. With sweep rakes and stackers (fig. 10), or with hay sleds, slings, and derricks (fig. 6), a large quantity of hay can be saved from overdrying or rain damage in a comparatively short time. Hay stacked in this way can be baled later in the season when other farm work is not pressing.

Stacking and baling hay from stacks is considered usually to involve a somewhat greater labor expense than windrow baling, but many areas are subject to local squalls and showers which come up unexpectedly and stop the work of a windrow-baling crew and damage hay in the windrows. A given hay crew can stack hay faster from the windrows than they can bale it. Thus the prompt stacking of hay is a constant safeguard against rain damage or overdrying so that through a period of years the smaller losses to stacked hay, as well as the better quality resulting from sweating, offset the somewhat lower costs for windrow baling.



FDA 12307

FIGURE 8.—Baling alfalfa hay. This is a good time to grade the hay. Unsound, very weedy, or otherwise off-grade bales that might injure the sale of a carlot should not be shipped with the better hay. Hay baled from the windrow should be pressed as loosely as will permit secure tying and the bales should be piled on edge, bottom side against fold side, and allowed to go through a sweat before being shipped.

Some of the highest-grade alfalfa hay produced in the country comes from districts where the hay is put up in large stacks with sleds and a derrick (fig. 6) and then allowed to sweat before being baled. Hauling the hay from the field on sleds keeps the hay free from dust and grit and preserves its leafiness to a greater extent than when it is pushed to the stacks with sweep rakes.

BALING DIRECT FROM THE WINDROWS

Baling direct from windrows is a popular practice among many producers of market alfalfa hay on both arid and humid areas because it saves some extra handling of loose hay, saves storage space for loose hay in barns or sheds in humid climates, and sometimes permits the rushing of hay into an early market or an under-supplied market.

Three methods of baling hay directly from the windrows are commonly used. One is to push the hay with the sweep rake from the windrows or bunches to the press (fig. 8); a second is to pick it up with a hay loader and wagon from the side-delivery-rake windrows and draw it by wagonloads to the press; the third is to pick up and bale the hay from the side-delivery-rake windrows with a "pick-up windrow baler" (fig. 9).

The chief difficulty in producing high-grade alfalfa hay by the windrow-baling method is getting the hay to the baler in a condition ideal for baling. This difficulty is solved to a certain extent



FDA 12306

FIGURE 9.—Baling windrowed alfalfa hay with a pick-up baler. If the hay is cured properly in the windrow this method of baling conserves color and leafiness, and the baled hay occupies less storage space than loose hay. In the arid and semiarid areas this method of baling is well adapted to production conditions.

when the pick-up baler is used. This machine consists of a traveling baler with a pick-up attachment similar to a hay loader to elevate the hay from the windrow. It is operated either by a power take-off from the tractor or by an auxiliary engine located in the front of the baling machine. Some types of pick-up balers are fed from the top and make the conventional perpetual-pressed bale. Others are fed from the side, and in this type the plunger has a knife on one edge which cuts the hay each time the plunger is driven to the rear. This latter type of baler produces a bale which does not have any folds and shows the cut ends of the hay stems on one side. Baling from the windrow is well suited to large acreages, and if care is taken, it is possible to produce high-grade alfalfa hay by this method of handling. Producers of market hay in the arid and semiarid areas could

profitably adapt this method to their local conditions in many instances.

Hay should be drier for baling than for stacking. Otherwise there may be severe losses because of later sweating and heating in the bale. If baling is delayed until the ideal condition for baling is reached by the hay in a large field, however, it is probable that some of the hay will overdry and shatter, while tough hay, if baled, is likely to heat and mold. If the hay is being harvested from small fields and if the baling press is owned by the owner of the hay, the owner can so regulate the different operations as to control the condition of the hay at the time of baling much more closely than if the hay is in large fields and the baling is done by contract and at times that cannot be fixed by the owner.

The condition of the hay at the time of baling may be controlled in part by regulating the quantity of hay cut down and windrowed according to the capacity of the press and by methodically drawing in or baling the hay from the field according to the extent of the curing in the swath and windrow. In the Southwest it is a common practice to cure the hay thoroughly and then to bale at night when the hay is tougher than during the daytime. The baling at night is usually done with a traveling or pick-up baler equipped with lights. By this method extremes of undercuring or overdrying can be largely avoided.

In addition to being handled under such field-management methods, hay baled from the windrow should be pressed as loosely as is compatible with secure tying, and before being loaded in cars the bales should be piled in such a way as to permit bale sweating without the development of heat and mold. The bales should remain in the pile until sweating is completed. By these methods high-grade alfalfa hay can be produced by windrow baling, although in most cases the quality factors of leafiness, color, aroma, and soundness can be more efficiently controlled by curing and sweating the hay in large cocks or stacks.

It is possible to make high-grade alfalfa hay by any of these methods if the crop is cut at the proper stage of growth and handled thereafter according to the fundamental principles that have been explained.

STORAGE OF LOOSE HAY TO RESIST WEATHER DAMAGE

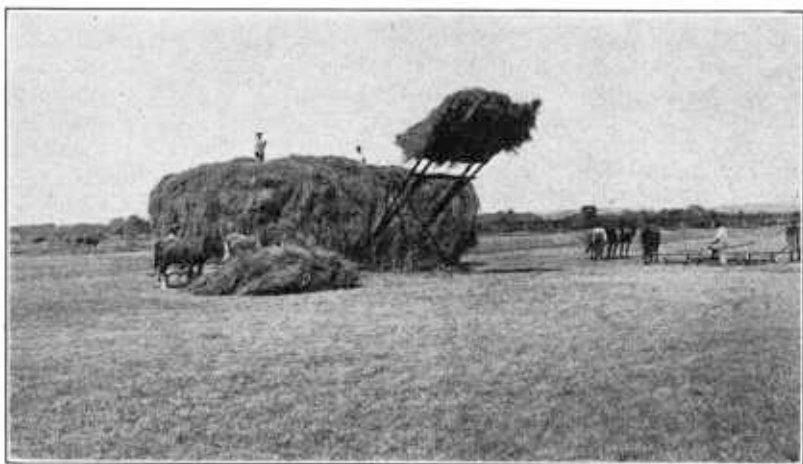
BARN OR SHED STORAGE

In very humid climates the ideal method of storing loose alfalfa hay is to place it in barns and sheds that will protect it from rain damage. By means of loaders, long racks, and slings, hay can be moved into such storage from the windrow rapidly and with little hand labor. In a locality having heavy rainfall, the construction of sheds equipped with carrier tracks and tackle for handling loose hay is often advisable and profitable for the producer who plans to market high-grade alfalfa hay. Such sheds permit thorough curing and sweating without incurring rain losses during the storage period and are useful for baling operations and for the storage of baled alfalfa hay that is awaiting shipment.

STACK STORAGE

In the arid and semiarid areas storage in stacks is the cheapest and most practicable method for protection against weather damage,

providing the stacks are well made and of large size. In many communities, however, where stacking is done with sweep rakes and overshot stackers (fig. 10) the desire to avoid pushing the hay long distances causes the building of many small, irregularly piled stacks in the field (fig. 11, *B*). Such stacks expose relatively large outside areas to weather damage, absorb much moisture from snow and rain, or may cause overdried hay in windy climates. Such stacks weather badly on the outside and often develop "stack spot" or white mold in the depressions and pockets into which the rains and snows settle. When hay is baled from such stacks and shipped to market many carlots will contain several grades each, and may contain a small percentage of Sample grade—unsound hay that will cause a severe discount in price on the entire carlot.



FDA 12305

FIGURE 10.—Stacking alfalfa hay with sweep rakes and the overshot stacker. Symmetrical and weather-resisting stacks of 15 to 20 tons can be built by this method. The better grade of hay usually obtained from the large stack more than covers additional costs for pushing the hay farther than is necessary for the stack of 10 tons or less.

In the stacking of alfalfa hay intended for market the possible saving in labor from the practice of throwing up numerous small stacks in a field, as compared with the practice of building a small number of large, well-made stacks, is usually more than offset by the losses in quality. The small additional cost involved in pushing or drawing the hay far enough to build a large stack and in keeping two men on the stack to build a symmetrical, well-tramped stack (fig. 10) will be returned usually with an extra profit in the higher grade and increased sale value of the hay. The percentage of weather-damaged hay on the outside of the stack to total stack tonnage is much less in large stacks than in small stacks. The risk of damage to the center of the stack is small if the stack is drawn out with side-wall bulges 3 to 4 feet above ground level, tramped solid in the center, and drawn to a peak at the top. In sections of considerable rainfall, a small load of wild hay or of wheat or rye straw may be used to finish the peak of the stack and to spread over the top

to assist in shedding rain and snow water. If the hay is to be baled for market, spoilage in the stack can be prevented by baling from 4 to 6 weeks after stacking or just as the hay is coming out of the sweat and before the moisture from fall and winter rains and snows has seeped into the stacks.



FDA 12042-A



FDA 12042-B

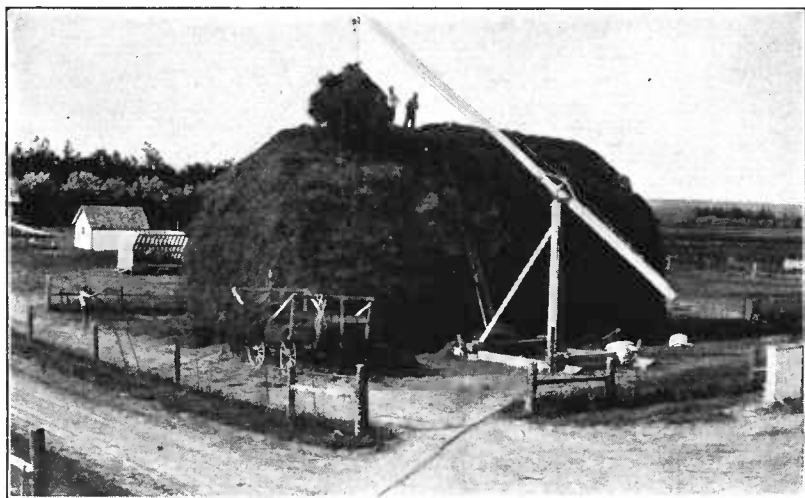
FIGURE 11.—A, A well-built stack, and B, a poorly built stack, both made with sweep rakes and the overshot stacker. Much low-grade alfalfa hay, some of which is unsound, is baled from small, poorly built stacks and shipped to the markets with little or no profit to the grower.

SMALL STACKS WASTEFUL

Stacks of less than 15 tons (fig. 11) are not so resistant to the weather as larger stacks, yet many stacks of 5 to 10 tons are put up every year in the extensive alfalfa areas, and from such stacks many carlots of U. S. No. 2 and U. S. No. 3 Alfalfa, mixed with some Sample grade, unsound alfalfa hay, are shipped to market. Stacks of 15 to 20 tons can be built under most conditions with the popular

sweep rake and overshot stacker equipment (fig. 10), provided the farmer organizes his hay crew and his field work by proper methods.

As a matter of fact, the highest-grade alfalfa hay put up in the West North Central and Mountain States, where stacking is common, is found in those localities where it is a common practice to build stacks of 25 to 100 tons by means of hay sleds, slings, and derricks (figs. 6 and 12), with two or three men constantly on the stack to spread and tramp the hay into a symmetrical and weather-resisting stack. Producers who do not favor this method of stacking should build maximum-size stacks with the overshot or swing-around stackers if they wish to make a high-grade product.



FDA 12100-A

FIGURE 12.—A large stack of alfalfa hay. A better grade of hay usually results when alfalfa is stacked in large, symmetrical, well-tramped stacks than when stacked in small stacks of less than 10 tons. The amount of weather-damaged hay is much less, the leaves cling better, and usually the hay has more aroma.

STACK DIFFERENT CUTTINGS SEPARATELY

Each cutting of alfalfa should be stacked separately so far as possible in order to provide hay of uniform class and grade at time of baling. In the stacking of alfalfa intended for market it is poor policy to put two or more cuttings in the same stack because of the variations in leafiness, color, grass mixtures, or stem texture that may exist and that would cause variations in grade.

Grade variations in stacks are very distinct in all cases where a stack is started with relatively coarse-stem first cutting, such as is common in the North Central and Mountain States and then built up and finished later in the year with second- and third-cutting hay having finer stems and a higher degree of leafiness. Similar distinct variations in class or grade occur when the midsummer cuttings, which often contain pigeon grass or water grass, are mixed with alfalfa of greater purity from the spring and autumn cuttings. Whenever it becomes necessary to top a stack with hay of a dif-

ferent cutting from that which is contained in the body of the stack, the different parts of the stack should be baled and piled separately.

BALING PRACTICE

SIZES OF BALES PREFERRED IN MARKETS

Whenever the individual producer, a neighborhood group of producers, or others interested in the baling of hay are considering the purchase of a hay press it is wise to select that type of press that will make bales of the size and weight best adapted to the demands of the markets in which the hay is to be sold. Certain hay markets in the United States favor certain types and sizes of bales and are prejudiced against other types. The box-pressed bale is preferred in certain parts of California. The 17- by 22-inch, perpetual-pressed bale, tied with three wires, and weighing from 125 to 150 pounds, is preferred in the Northeast and the Pacific States, and the perpetual-pressed bales, 14 by 18 or 16 by 18 inches, tied with two wires and weighing from 80 to 90 pounds, is preferred in the South and Middle West.

The shipper or producer will always benefit by catering to the preference of his market. He cannot afford to ignore the established market demands.

MAKING ATTRACTIVE BALES

Neatness and tight tying of the bales are other important features of hay marketing. Ragged, loose, or unevenly tied bales are sometimes discriminated against in price, because they give the lot an unattractive appearance, and because they are likely to be broken when handled. It pays to give thought and care to the feeding of the press, to its tension, and to the tying. Press feeders should be instructed to throw out the occasional bunches of coarse weeds, sweet clover, and spoiled hay that are often found mixed with good hay. The appearance and sale value of a lot of good hay can be injured by the presence of a few bales that contain slugs of weeds or unsound hay.

When hay is baled from the stack great care should be taken to remove the weathered top and sides of the stack before baling. Moldy or stack-burned hay which is occasionally found in the center or at the bottom of the stack should not be fed into the press. A relatively small percentage of such stack-injured and low-grade hay will spoil the general appearance of a baled lot of good hay, and may cause a lowered price for the entire lot.

CONDITION OF HAY AT TIME OF BALING

The condition of hay at time of baling is of the utmost importance. It is folly to bale hay from windrows, cocks, or stacks that are damp from rain or snow or that are distinctly undercured. To do so invites a shipper's loss from hot and moldy hay. Heavy and tightly compressed bales are the cause of many severe losses in slightly tough and unsweated hay baled from windrows and cocks. Unsweated and slightly undercured hay should be baled as loosely as is compatible with the making and tying of a bale that will stand later handling and

shipment without breaking open. Loosely pressed bales of slightly undercured hay will permit bale sweating to take place without the development of extreme heat and mold, whereas hay of the same condition, pressed into tight, heavy bales, is almost certain to develop must or mold inside the bales, and often large numbers of bales will spoil throughout.

In hot, dry climates, or in windy climates, the baling of alfalfa hay during hours of high temperature or steady winds will often cause such a severe shattering of the leaves as to lower the grade from U. S. No. 1 Alfalfa, which is required to be green, to that of U. S. No. 2 Green Alfalfa, the latter grade being a good milling hay but a poor type of dairy hay.

In baling as well as in curing operations consideration must be given to the preservation of leafiness. Much attention is given to this matter in a number of western communities that specialize in the production of alfalfa hay for the dairy trade, and all baling is done in the early morning or late evening hours, when temperatures are relatively low and humidity is relatively high.

Without question, such baling methods are profitable. The bales so made are leafier, and the leaves cling better than in the case of bales made during midday hours. A local adaptation of this practice can be made to advantage in all areas that produce alfalfa hay for market, so that the baling may be done during such hours of the day or such seasons of the year as are most favorable to the preservation of leafiness.

BALING STACKED HAY

In the West North Central and Mountain States, where the stacking of alfalfa hay is a common practice and where rains and snows often cause damage to a portion of the stacks, it would pay the producers and shippers well to bale large quantities of the hay intended for market at the most favorable baling seasons and then to store the bales in sheds or warehouses until the owners are ready to ship. By such methods the considerable losses in quality suffered each season from weathering, stack spot, or shattered leaves could be largely avoided. A higher average grade of hay would result and it would attract many profitable orders for the community.

Weather conditions permitting, the most favorable time to bale stacked hay is just at the close of the sweating period. At this time the stacks have not been subjected to much, if any, weather damage, and the hay is sufficiently tough to preserve clinging foliage in the bales, providing the baling is not done during hours of very high temperatures nor on very windy days.

STORAGE OF BALED HAY

In advance of the most active shipping seasons the storage of baled hay is a practice that has distinct business advantages for the producer and shipper. Often in the stormy winter or early spring months unforeseen shortages arise in hay-consuming districts which cause the sudden placing of many orders for immediate shipments. Under these conditions the distributing markets become unusually active. Those shippers who have many carlots of well-cured, baled hay under roof

(fig. 13) and close to railway sidings are in a position to fill rush orders several days sooner than the shippers who must bale from stacks or possibly must haul hay over bad roads before shipment can be made. The ability to load promptly plus the ability to load well-cured, sound hay of high grade and attractive appearance, means maximum prices and satisfactory sales.

The development of baling, storage, and sales methods of this character means the eventual development of a community reputation for prompt shipments of high-grade hay. This will bring a demand for hay from every consuming district within the freight-rate zone that favors hay movements from the producing area.



FDA 12065

FIGURE 13.—A storage shed for baled hay. Storage in advance of the most active shipping seasons usually reduces loss from weather damage and permits baling during days favorable to preservation of quality. It facilitates quick loading during periods of storm, impassable roads, and unforeseen shortages. Ability to confirm an order for hay for immediate shipment often means a satisfactory sale at the highest price.

ADVANTAGES OF FARM-OWNED PRESSES

Baling operations essential to the production of high-grade hay are much easier to control when the press is individually owned and is operated under the personal direction of the farmer. Under these conditions it is possible to control the condition of hay at the time of baling, the elimination of spoiled hay and trash when feeding the press, and the size, weight, and tying of the bales, much better than when the baling is done under a contract arrangement. Baling outfits that work by contract are always chiefly interested in tonnage per day. Therefore it is often difficult to obtain the same high grade of hay from such baling as is possible from the operation of individually owned presses. This is especially true in all cases of baling from windrows or cocks whenever the contract outfit is not available at those hours when the hay is in prime condition for baling. Alfalfa producers who plan the specialized production of market hay will

find it profitable in most cases to own and operate their own small power presses.

If contract baling is employed the owner of the hay can well afford to devote his time to the general superintendence of the work and to direct personally the raking of stacks, the throwing aside of spoiled hay and trash by the feeders, the tension of the press, and the tying of the bales, to conform to his needs and plans.

GRADE HAY AT BALING TIME

At the time of pressing, an ideal opportunity is given the farmer to cull out any unsound, very weedy, or otherwise off-grade bales as they come from the press, and to pile the bales according to grade (fig. 8). At this stage in the preparation of hay for market, it costs practically nothing to sort the bales into piles of approximately uniform class and grade, and thus make it possible later to load carlots or truckloads of uniform hay without any additional expense for sorting, or without the necessity for slowing up the work of loaders in order to cull out the unsound, weedy, or off-grade bales.

As a matter of fact, if care is not taken to do the sorting and culling at the press it rarely is done in the rush and hurry of loading. Thus the lot may go to market containing a number of unsound or offgrade bales that will depreciate the sale value of the entire lot.

PILING BALES OF UNSWEATED HAY

RISKS IN SHIPPING UNSWEATED HAY

In the great majority of cases it is a very dangerous practice to load newly harvested and unsweated alfalfa hay into box cars. Many carlots of slightly undercured and unsweated alfalfa hay are annually shipped to market, especially during the summer months, which arrive hot or heating and sometimes musty and moldy. The fully hot or the moldy hay often represents a serious loss to the shipper as the dealer who buys the hay cannot recondition it, and buyers for such hay are few in number.

The dealers cannot even place warm, sweating carlots on orders from out-of-town customers until the hay has been cooled, sorted, and reconditioned because of the danger from heating and from mold development in transit. Reconditioning, either on the hay tracks or at warehouses, takes time and costs money, and so the costs and losses are naturally and justifiably reflected in the prices paid to the shipper for such hay.

A certain quantity of baled alfalfa hay that is heating and sweating finds a sale at the terminal markets to dairymen who have the facilities to pile and store hay where it can be reconditioned and sweated and who want to take advantage of the comparatively low prices usually prevailing for this kind of hay. However, such hay brings little or no profit to the producer. Many other dairy feeders, however, do not want to bother with unsweated hay because of the risks involved in handling or (if the hay is wanted for immediate use) because dairy cattle, as a rule, do not relish hay that is in the process of sweating as much as hay that is completely sweated.

As a general rule, therefore, the marketing of undercured and unsweated alfalfa hay is comparatively unprofitable to the producer and shipper. A few exceptions to this general rule can be found, notably in the preparation of alfalfa hay for immediate consumption in rabbitries, but in the vast majority of cases a relative loss in profits results from the marketing of undercured alfalfa hay.

METHODS FOR SWEATING HAY IN BALES

Producers who wish to bale alfalfa hay from windrows or from cocks that have been made only a few days can profit in practically all cases by piling the bales in such a way as to provide for some aeration and to permit bale sweating prior to loading and shipping. The bales should be piled on edge, with the bottom or chaff side of one bale laid on the top or fold side of another bale. This permits heat and moisture to escape during the process of fermentation much better than when the bales are piled with the flat side of one bale against the flat side of another. In building the pile a few narrow, open spaces should be left between the vertical tiers in order to facilitate aeration. When newly harvested alfalfa is baled in loose bales and piled by these methods the normal and inevitable sweating will take place without the development of such discolorations, caking, or moldiness as commonly develop when such hay is loaded into cars immediately after it has been baled.

If piles of bales are made in the field the use of tarpaulins or straw coverings is necessary at times to protect the bales from rain damage. Wherever the operations are on an extensive scale in humid climates the construction of one or more cheap storage sheds is warranted. Bales piled in the field in arid climates quickly bleach to a yellow color on the outside of the pile, but as the amount of bleached bale surface is very small in proportion to the total bale surface in the pile the color of the entire lot is rarely affected enough to affect the grade by color.

LOADING CARS AND TRUCKS

Numerous carlots that arrive in the markets in a wet, damp, or hot condition during the autumn and winter seasons contain alfalfa hay that was properly cured and sweated but that became wet from snow or rain while being hauled and loaded into the cars. Hay that has become wet or damp in this way will sometimes develop heat and mold when packed tightly in box cars even though freezing temperatures prevail while the hay is in transit. In the United States standards, wet, heating, hot, or moldy hay is graded Sample grade, and its sale value is lower, of course, than dry, sound hay in good shipping condition. Shippers should haul and load hay only during fair weather.

LOADING NEWLY HARVESTED HAY

In loading bales of newly harvested and tough alfalfa hay the bales should always be set on edge in the cars with the bottom or chaff side of one bale laid against the top or fold side of another. In building up the vertical tiers of bales a few narrow spaces should be left here and there in the load to permit some aeration and the escape

of heat and moisture in case fermentation starts during transit. Many cars of slightly tough alfalfa go out of condition during transit because the bales are piled flat side against flat side and are very tightly packed in the car. Careful piling on edge is of considerable assistance in holding down such losses.

LOADING THE DOORWAYS

In loading bales in the doorways many shippers make the mistake of allowing the flat or bottom sides of the bales to face outward. Such doorway loading is unworkmanlike and disadvantageous to the shipper for two principal reasons. In the first place the flat or bottom sides of the bales appear either stemmy or chaffy and thus give the doorway hay the poorest possible appearance in the eyes of the buyer, who gets his first impression of quality from the doorway bales. In the second place it is difficult for the hay inspector to appraise the leafiness of alfalfa from either the sides or bottoms of the bales. Judging alfalfa hay as to its leafiness is best done from the ends or topside of the bales.

For these reasons the best method to follow when loading in the doorway is to have the ends of the bales in each tier face outward. Loading the bales thus in neat tiers gives the lot of hay an attractive appearance and permits the inspector to examine the leafiness quality more accurately in all cases in which only doorway inspections are possible.

LOADING CARS AND TRUCKS WITH HAY OF UNIFORM CLASS AND GRADE

The most important item of all in loading practice is to load cars or motortrucks with hay of uniform class and grade. Uniform loads (fig. 14) invariably sell for better prices than nonuniform loads, and sometimes the difference in price is substantial. Shippers should remember that dealers cannot use nonuniform loads to fill definite orders for carlots of U. S. No. 1 Alfalfa, U. S. No. 2 Alfalfa, U. S. No. 2 Leafy Alfalfa, or any other definite grades. As a result, the nonuniform loads bring less money than the uniform loads and often sell on the basis of the lowest grade found in the carlot.

Shippers often criticize dealers and receivers of hay for settlements effected on car or truck lots of this character, when, as a matter of fact, the entire fault is with the shipper for having loaded the car or truck with hay of nonuniform grade. Buyers who order a carlot of alfalfa hay of any specific grade expect the delivery of a uniform load according to their specifications, and they are intolerant of mixed car or truck lots.

The greater number of controversies, rejections, and unforeseen expenses arising out of demurrage, telegrams, discounts, and diversions are caused by the nonuniformity of the load of hay. It is always profitable to load uniformly and always relatively unprofitable to load cars with part No. 1 and part No. 2 grade, or part No. 1 Alfalfa and part No. 1 Alfalfa Heavy Grass Mixed, or to "salt" or "plug" cars of sound hay with a few bales of unsound hay.

The reprehensible practice of facing the doorways with high-grade hay and loading low-grade hay in the ends of the car or in the tier of

bales on the floor, is rarely profitable to the shipper. In most cases the deception is discovered when the car is plugged for inspection (fig. 14) or when unloading begins, after a doorway inspection. In either case settlement may be made on the basis of the lowest grade in the lot, or at best the settlement made for the low-grade portion of the lot is on the basis of the buyer's offer.



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FIGURE 14.—A Federal hay inspector making a “complete inspection” of a carlot of alfalfa hay in a terminal market. A plug is taken from the bales in the doorways and from the ends of the car. Nonuniform loads often sell on the basis of the lowest grade in the carlot. It is always profitable to load hay of uniform class and grade.

INVOICING A MIXED CARLOT

Circumstances are such, at times, that it is impossible for the shipper to load a carlot of uniform class and grade. Under such cir-

cumstances it is always advisable to load the hay of one class or grade in one end of the car, and the hay of another class or grade in the other end of the car. A tally should be kept of the number of bales of each class or grade, and the bale count should be noted on the shipper's invoice. Buyers and dealers greatly appreciate this frank and businesslike procedure, and mixed carlots so invoiced always sell for a better price than when bales of various classes and grades are loaded in a mixed and disorderly way.

PROTECTING TRUCKLOADS OF HAY FROM RAIN

Trucks used for hauling hay should always carry canvas or tarpaulins which are large enough to cover the entire load in case it is necessary to protect the hay from rain. Covers which protect only the top of the load are not sufficient because the sides and ends of the load may get wet, and the whole load may become musty and moldy if the wet bales are scattered through the pile when the hay is unloaded. Covering the entire load also prevents the lower tier of bales from becoming wet and soiled from the road dirt that is thrown up from wet roads.